

Changes in Head Stability Control in Response to a Lateral Perturbation while Walking in Older Adults

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Falling is a main contributor of injury in older adults. The decline in sensory systems associated with aging limits information needed to successfully compensate for unexpected perturbations. Therefore, sensory changes result in older adults having problems maintaining balance stability when experiencing an unexpected lateral perturbation (e.g. slip) in the environment. The goal of this study was to determine head stability movement strategies used by older adults when experiencing an unexpected lateral perturbation during walking. A total of 16 healthy adults, aged 66-81 years, walked across a foam pathway 6 times. One piece of the foam pathway covered a movable platform that translated to the left when the subject stepped on the foam. Three trials were randomized in which the platform shifted. Angular rate sensors were placed on the center of mass for the head and trunk segments to collect head and trunk movement in all three planes of motion. The predominant movement strategies for maintaining head stability were determined from the results of the cross-correlation analyses between the head and trunk segments. The Chi square test of independence was used to evaluate the movement pattern distributions of head-trunk coordination during perturbed and non-perturbed walking. When perturbed, head stabilization was significantly challenged in the yaw and roll planes of motion. Subjects demonstrated a movement pattern of the head leading the trunk in an effort to stabilize the head. The older adult subjects used this head stabilization movement pattern to compensate for sensory changes when experiencing the unexpected lateral perturbation.